

X. *On the Habits of the Species of the Coleopterous Genus Megacephala, inhabiting the Amazonian Region of South America.* By H. W. BATES, Esq., with a Synopsis of the Species by J. O. WESTWOOD, Esq., F.L.S., &c.

[Read 7th June, 1852.]

THROUGHOUT the whole country, from the city of Para to Ega, on the upper Amazons, I have found eleven species of the genus *Megacephala*. They are all inhabitants of sandy soils in exposed situations, none being found in the shades of the humid forests which cover nearly the whole surface of the country. I believe they are all nocturnal in their habits, except perhaps the *M. sepulchralis*, Fab., in the daytime being concealed several inches deep in burrows in the sand. I have never observed any one make use of its wings, which the *Cicindelæ* and *Odontocheilæ* so readily do, but their powers of running exceed anything I have ever observed in this style of insect locomotion; they run in a serpentine course over the smooth sand, and when closely pursued by the hand, in endeavouring to seize them, they are apt to turn suddenly back, and thus baffle the most practised hand and eye. Nearly all the species are confined to the margins of the river, on the sandy beaches and extensive sand banks in mid-river; and are found chiefly in the dry season, most abundant when the sinking waters have left exposed the largest extent of sand. The pallid-coloured series of species, of which I have observed five, are quite confined to the most extensive of the sandy beaches, where the sand is finest and whitest, which begin only at the altitude of Santarem. In their pale colours, with dusky marks or patches on the elytra, they resemble the *Nebria complanata* of the sandy sea shores of Europe, which has a similar aspect and habits, and in taking these *Megacephalæ* I have been forcibly reminded of the *Nebriæ*, their colours respectively agreeing with those of the locale they inhabit. There is another instance of the same relation here, in a large species of *Forficula*, of the same pallid colours, and found also on these sandy shores. There are, throughout the various branches of Zoology, many instances of this relation between the colours of species and the locale they inhabit, and all such facts, when observed, appear to me deserving of record, although it may be far in the future of the history of science before any useful generalization be drawn from them.

The *Megacephalæ* are closely allied to the *Cicindelæ*, and the

two genera are naturally placed in close vicinity in the same group of genera of *Cicindelides*. Relatively to the *Cicindelæ*, the former have a body more robust, a broader and stronger head and thorax, with, consequently, stronger mandibles, showing a habit of preying upon larger subjects, and greater force in tearing their food; their antennæ are longer and more tapering, showing probably an acuter sense, whatever that sense may be which resides in those organs. Lastly, their legs are much more robust, agreeing with their terrestrial habits. They may be defined shortly as robust, terrestrial (cursorial), and nocturnal *Cicindelidæ*.

The larvæ of *Megacephalæ* inhabit the same sandy districts as the perfect insects, in cylindrical burrows, where they lie in wait for prey. I have taken two or three species, none of which differ in any essential particular from the descriptions of the larva of *Cicindelæ*. The head is broad, semicircular, concave above and concave-convex beneath, with the mandibles curved upwards, so as to be able to seize anything falling on the concave upper surface of the head. They are so rapacious or irascible, seizing anything that disturbs them, that they are readily taken by inserting a straw in their burrows, which they seize instantly and retain with pertinacity.

Of the eleven species which I have taken, five are of the pale-coloured series; five of the brilliant-metallic species, copper-coloured green or blue, all with an ovate pale spot at the apex of the elytra; and one is obscure black. The last-mentioned (*M. sepulchralis*, F.) is different in its habits, as well as in its colour and form, from the other two groups. It is found in dry gravelly places, in open grassy spaces in the forest, running rather slowly about the roots of grass in the daytime. I have taken it only at the Barra of the Rio Negro, where the country is dry and undulating, and the forest somewhat low and thinned. The largest of the pale species, about an inch long, is the robust *M. testudinea*, which I took in company with three other species of the genus on the sandy shores of the Tcffé at Ega, at night. One small, smooth, pale species (*M. laminata*, Perty), having a diamond-shaped dusky spot over the suture of the elytra, I have found on all the more extensive sandy beaches, more or less sparingly, from Carefé, near Pará, to Ega. One pale, nearly spotless species (*M. cruciata*), 9 lines long, I took only at the Barra, whence I sent a small series to England. Another nearly resembling this (*M. bifasciata*, Brullé) I have taken more abundantly at Ega and at Santarem. A fifth species (*M. asperula*), small, and covered with elevated granulations, I took only two specimens of, on the sand islands in mid-river, on the Upper Amazons. In the

metallic coloured group one species (the beautiful *M. Spixii*) I found rather abundantly at Villa Nova, on the light earthy or sandy margins of the river, where the fluctuating level of the waters leaves a succession of terraces. By cutting away the edges of these terraces I was able to get at their burrows readily, and took as many as I wanted. Another copper-coloured, very handsome species, more robust in form (*M. curta*, Reiche), is found at the moist edges of the water, under stones and sediment. Of one fine green species (*M. spinosa*?), distinguished by a small tooth at the sutural angle of the apex of the elytra, I, at present, have only a single specimen from the extensive sandy campos of Santarem. The fourth species, which is elongated in form, of a fine uniform blue or blue green colour (*M. Martii*), I have found also at Santarem, very circumscribed in its localities; it prefers dry gravelly situations, and is only seen after sunset. The fifth and last species is the smallest of the metallic group, having the elytra much narrowed towards the apex (*M. quadricollis*, Laf.). I have met with it only at Ega, in company with *M. testudinea* and two other pale species.

H. W. B.

List of the Species mentioned in the preceding Memoir.

A. Black species (*Aniara*, Hope).

- Sp. 1. *Megacephala sepulchralis*, Fabricius, Syst. Eleuth. p. 233, n. 9 (*Cicindelae*), Dej. Sp. Gen. v. 199, n. 7.
Meg. variolosa, Dej. Sp. Gen. i. 14, n. 7.

B. Pale coloured species. (*Ammosia*, Westw.)

- Sp. 2. *Megacephala testudinea*, Klug, Jahrbucher D. Ins. p. 6, pl. 1, f. 2.
M. Klugii, Moritz, MS.

Mr. Bates' specimens of this species are chestnut red on the upper side, without any gloss, and with paler lateral margins and luteous buff beneath. The head is smooth above, except between the eyes, where it is finely striolated, the striolæ of the disc being almost obsolete, the inner margin of the eyes black. The labrum is transverse, pale luteous, the lateral angles rather porrected and rounded, the centre porrected and armed with two obtuse black teeth; half-way between the produced middle and the lateral angles is another small tooth on each side; the mandibles are pale luteous, with black teeth, the right one in the male having the second tooth from the tip very minute, and the third oblique emarginate at its tip, whilst in the female it has three large terminal

teeth, and the left one in both sexes has the first and third large, with a small one between them; the labial palpi are remarkably long, the antennæ pale luteous, with the first four joints more or less marked with black on the upper side. The pronotum is nearly smooth above, with two transverse punctured impressions, the ordinary longitudinal one only slightly impressed, the portion behind the second transverse impression is black. The elytra are broader behind the middle, and covered with extremely numerous and very minute conical granulations, those of the disc being the largest, the points of which are directed backwards; at about one-third of the width of the elytra, on each side of the suture, is an irregular row of deeper punctures, forming an indistinct longitudinally impressed striola on each elytron; beyond the middle, and towards the side, is a somewhat oval black spot, its inner margin oblique, and produced behind into a small, slender, curved mark, directed towards the suture, beyond which the elytra are pale luteous, as well as at the sides. The whole of the underside of the body, palpi and legs are luteous, the four posterior femora having a black spot near the tip on the upper side.

Long. corp. ♀ lin. $1\frac{1}{2}$.

Having no typical specimen of *M. testudinea* for comparison, it is not possible to decide with certainty whether Mr. Bates' specimens are specifically distinct from that species, several of the characters mentioned above being omitted in Dr. Klug's description.

Sp. 3. *Megacephala laminata*, Perty, Del. An. art. Bras. 1, p. 2, pl. 1, f. 3.

M. nocturna, Klug, MS., Dej., Sp. Gen. v. p. 203.

Sp. 4. *Megacephala bifasciata*, Brullé in D'Orbigny, Voy. Amer. merid. VI. ii. p. 1, pl. 1, f. 1.

M. æquinoxialis, Fabr., Dej., &c., but not of Linnæus, which = *Brachinus complanatus*, F.

Dr. Erichson, Jahrbucher Entomol. 1837, n. 209, considers that the name *M. æquinoxialis* should, however, be retained, as having been used by Fabricius in a genus far removed from *Brachinus*; but it is quite evident, from the words of Fabricius, Syst. Eleuth. i. p. 243, n. 60, "Species mihi obscura," that he had never seen it, but had merely taken it up from the writings of Linnæus.

According to M. D'Orbigny this species rests, during the day, at the bottom of holes, which it burrows in the margins of rivers, coming abroad only on the approach of night, and running with extreme velocity.

Sp. 5. *M. cruciata*, Brullé in D'Orbigny, Voy. Amer. merid. VI. ii. p. 2, pl. 1, f. 2.

Depressa, flavo-rufa, subtus pallidior; ore, antennis pedibusque flavis; elytrorum vitta suturali fasciaque fuscis. Mas. Long. $7\frac{1}{2}$, lin.

Northern part of Corrientes, on a sand bank at Parana.

One-fourth smaller than *M. bifasciata*, with the elytra very strongly punctured, and without the black band between the eyes; the denticulations of the labrum are also more porrected. It runs with very great agility, and "semble plutôt voler que marcher."

Messrs. Tatum and S. Stevens regard this supposed species as a very pale variety of the preceding, which, indeed, greatly differs, in the extent of its markings, some specimens having the disc of the elytra almost entirely black. Mr. Bates' capture of specimens in a single locality, apart from that which afforded the true *M. bifasciata*, is in favour of their specific distinction.

Sp. 6. *M. asperula*, Westwood.* (Tab. VII. f. 8.)

Testaceo-lutea; antennis, palpis et pedibus albidis; capite in medio fusco, elytrorum sutura late, fasciaque utrinque abbreviata pone medium fuscis, pronoto antice et postice elytrisque undique granulato-asperulis, his brevibus latis obovatis.

Long. corp. lin. 5.

Syn. *M. brevis* and *M. brevipennis*, — MS. in museis.

* Obs.—The five species above mentioned are the only ones hitherto known belonging to the pallid division of the genus. I therefore take this opportunity of describing another new species, from the collection of T. Tatum, Esq., who received it from the Jardin des Plantes, without any indication of its locality.

Megacephala Oxycheiloides, Blanchard, MS.

M. nigricollis, Reiche.

M. nigra, haud nitida, depressa; capite antice, antennis, pedibus, elytris utrinque macula magna triangulari laterali, alterisque duabus apicalibus albidis ♀. Long. corp. lin. $8\frac{1}{2}$.

Præcedentibus magis depressa coloreque nigro corporis, capitis et pronoti distincta. Caput subquadratum, oculis prominulis, vertice planiusculo sub lente striatulo, macula antica semicirculari albida. Labrum transversum, albidum, medio antice valde porrectum, denticulis duobus centralibus acutis alterisque duobus lateralibus, dentibus apice castaneis. Mandibulæ albidæ, dextera dentibus tribus validis apicalibus, sinistra tribus intermedio parvo. Palpi albidii, labiales articulo penultimo valde setoso, ultimo paulo securiformi. Pronotum truncato-cordatum, subdepressum, impressionibus duabus transversis ordinariis fere obsoletis, media longitudinali tenui, disci medio lævi, antice et postice sub lente tenuissime coriaceo. Elytra suboblonga, depressa, fere parallela, depressa, disco undique granulis minutis conicis (apicibus postice directis); nigra, singulo macula magna laterali irregulariter triangulari, suturam haud attingente, e basi ad medium lateraliter extensa, alteraque subovali apicali. Corpus infra nigrum, læve, subnitidum; apice segmenti apicalis abdominis albido. Pedes omnino albidii.

M. laminatæ magnitudine et forma proxima, differt imprimis pronoto et clytris aspero-granulatis, granulis nigris. Caput breve, pronoto latius, fere læve, disco parum convexo in medio fusco, margine interno oculorum tenue nigro. Labrum luteo-albidum, angulis lateralibus rotundatis, margine antice denticulis 4 minutis æqualibus et æquidistantibus. Mandibulæ albidæ, dentibus apice castaneis, dextera dentibus tribus validis, sinistra etiam tribus intermedio parvo. Palpi albi, maxillares articulo 2do parum inflato. Antennæ graciles, albidæ, articulis 2do, 3tio, et 4to supra fusco parum tinctis. Pronotum lateribus antice fere rectis, pone medium sensim angustatis; disco convexo, impressionibus binis ordinariis transversis indistinctis, media longitudinali tenui sat distincta, antice et postice granulato. Elytra brevia, obovata, albido-lutea, undique granulis minutis nigris aspera, cruce fusca reversa notata apice crucis acuminato, apice suturæ albido relicto; margine tenuissimo laterali fusco. Pedes graciles, albi. Corpus infra fusco-luteum, abdominis apice pallidiori.

Obs.—The specific names attached to this insect in several collections, without any author's name attached, are equally applicable to *M. laminata*, whilst the remarkably granulated surface of the elytra suggests a name at once indicative of the species.

C. Metallic coloured species. (*Tetracha*, Westw.)

Sp. 7. *Megacephala Spixii*, Brullé in D'Orbigny, Voy. Amer. merid. VI. ii. p. 3, pl. 1, fig. 3. (Tab. VII. fig. 5.)

Obs.—Dr. Erichson, Jahrb. Entomol. 1837, p. 209, considers this as not distinct from *M. Martii*, to which indeed it is very closely allied in form, sculpture and colour of the limbs. The observations, however, of an intelligent collector like Mr. Bates upon these insects in their native country, warrants their retention as distinct.

Sp. 8. *Megacephala Martii*, Perty, Delect. An. Art. Bras. p. i. pl. 1, fig. 1. (Tab. VII. fig. 3.)

Sp. 9. *Megacephala curta*, Reiche? MS. (Tab. VII. fig. 1.)

M. capite, pronoto et elytrorum disco læte purpureo-cupreis, horum lateribus cyaneis, apice singuli macula elongato-ovali lutea notatis; pedibus luteis, geniculis posticis nigris.

Long. corp. lin. 8.

Affinis *M. geniculatæ*, Chevrolat, et *M. Chiliensi*, Laporte. Caput læte cupreo-purpureum, antice et lateraliter viridi-tinctum, vertice sub lente tenuissime striolato et areolato, punctis duobus parvis ad marginem internum oculorum, impressionibusque duabus minus profundis inter partem anticam oculorum. Labrum, mandibulæ et antennæ lutescentes, illarum dentibus nigris, harum articulis 4 basalibus supra fusco-notatis. Pronotum valde convexum, lævissimum, colore capiti simile, impressionibus ordinariis profundis. Elytra quam in *M. Martii* breviora et magis ovata, disco antice coloris capitis et pronoti, hoc colore ultra medium suturæ extenso at sensim angustato; lateribus elytrorum cyaneis viridi-tinctis, maculaque elongato-ovali lutea, ad apicem costæ angustius producta, disco punctatissimo. Corpus infra nigrum, coloribus metallicis tinctum. Pedes lutescentes, femoribus 4 posticis prope apicem supra fusco-tinctis.

Obs.—I cannot distinguish this species from the insect in the British Museum collection with the name of *Meg. remota*, Reiche, MS. attached to it.

Sp. 10. *Megacephala* — ?

Obs.—Mr. Bates' unique specimen of this insect has not yet reached this country, but from his notes it is most probably either *M. spinosa*, Brullé in Voy. D'Orbigny, Amer. merid. VI. ii. p. 3, n. 7, or *M. acutipennis*, Dejean, Sp. Gen. i. p. 13, n. 6.

Sp. 11. *Megacephala quadricollis*, Laferte? MS. (Tab. VII. fig. 7.)

M. prothorace subquadrato, elytris ad apicem spinosis; supra viridis; elytrorum lateribus postice luteo-albidis; ore, antennis pedibusque luteo-albidis.

Long. corp. lin. $6\frac{1}{2}$.

Species parva, forma prothoracis et elytrorum spinisque apices horum armantibus primo intuitu distinctissima. Caput supra cupreo-viride, vertice subconvexo, sublævi, prope marginem internum oculorum longitudinaliter striatulo, impressionibus

inter partem anticam oculorum obsoletis. Labrum transversum, lutescens, fusco tenuissime marginatum, denticulis duobus mediis parum prominentibus. Mandibulæ et antennæ lutescentes, illarum dentibus nigris, harum articulis 4 basalibus supra fusco-notatis. Prothorax subquadratus, capite paullo angustior, postice vix angustior, lateribus fere rectis, sulco profundo angusto sinuato antico, alteroque recto postico transversis; lineaque media ordinaria profunde impressa; dorso lævi, cupreo-viridi, lateribus sulcoque antico tenuissime punctatis, parte postica pone sulcum posticum irregulariter granulata. Elytra elongato-ovalia, disco granulis conicis minutis scabro, cupreo-viridia, singulo macula elongata laterali lutescenti postica, ad apicem suturæ extensa, singuloque in spinam acutam sensim desinente. Corpus infra viride, abdomine lutescente. Pedes lutescentes, femoribus 4 posticis ante apicem fusco-nebulosis.

The following is a tabular classification of the species of *Megacephala*, showing the position of the subgenera indicated above, founded for the most part on the variations in the dentition of the mandibles. This is a character which has been generally overlooked by Entomologists, although the use made of it in the higher branches of zoology show its great value. It is true indeed that in most modern generic descriptions the form of the mandible is given, but this is drawn almost universally from the inspection and figure of a single jaw, whilst the comparative form of the two mandibles, and the mode in which their combined action modifies the form and position of their relative toothings, is generally neglected. The genus *Megacephala* was first divided by Serville and St. Fargeau, in the *Encyclopédie Méthodique*, into two sections, from the wingless and winged condition of the species, the name of *Aptema* being given to the former group, the type of which was however that of the genus *Megacephala*, whilst a second species was added (*M. 4-signata*), which is certainly winged. Mr. Hope, in the second part of his *Coleopterist's Manual* (p. 6), restored the generic name *Megacephala* to the type *M. Senegalensis*, dividing it into two sections, 1st, that containing the type, destitute of wings, and, 2nd, that containing *M. 4-signata* and *Euphratica*, both of which are winged, adding two new genera, *Tetracha*, Westw., containing *Cic. Carolina*, Linn., and its allies, natives of the New World, having the mandibles armed with four apical teeth, and *Anaira*, the type of which is *M. sepulchralis*. A nearly similar arrangement was adopted by M. Lacordaire in his revision

of the family published in the first volume of the Memoirs of the Natural History Society of Liège. A careful examination of the characters of the *Megacephalæ* has convinced me that a more extensive division is requisite; in other words, that the characters employed to separate *Tetracha* and *Anaira* will render the establishment of several other sections necessary when applied to the Old World as well as to the pale species of the New World.

MEGACEPHALA.

A. Elytra humeris rotundatis, haud angulato-prominentibus.

* Corpus apterum, subcylindricum. Mandibulæ dentibus acutis. Color viridi-metallicus, elytris totis concoloribus. (*Aptema*, Serv. and St. Farg.) Type *M. Senegalensis*, Latr., Dej.; *Cic. megalcephala*, Fabr. (Senegal.)

** Corpus alatum, latius, subdepressum.

a. Mandibulæ dentibus intermediis oblique truncatis. Color metallicus, elytris ad apicem macula lutea notatis. Types *M. 4-signata*, Dej. (Senegal); *M. Bocandei*, Guérin-Ménéville, Rev. Zool. (Congo.)

b. Mandibulæ dentibus intermediis acutis, sinistra dente 2do (apice acuto mandibulæ pro dente 1mo computato) parvo vel 3tio minori. Color luteus. (*Ammosia*, Westw.) Type *M. bifasciata*, Brullé (*Æquinocialis*, Dej.) (Amer. merid.)

B. Elytra humeris angulato-prominentibus.

* Mandibula recta, dentibus tribus apicalibus armata (dente basali composito denticuloque ejus supero haud computatis).

† Mandibula sinistra dente 2do minuto. Color metallicus, elytrorum apice macula lutea notato. Type *M. Euphratica*, Oliv., Dej. (Persia, India, Spain, Barbary.)

†† Mandibula sinistra dente 3tio fere obsoleto. Color totus niger. (*Anaira*, Hope.) Type *M. sepulchralis*, Fabr., Dej. Sp. Gen. v. 199 (*M. variolosa*, Dej. Sp. Gen. i. p. 14) (Amer. merid.)

** Mandibula recta dentibus quatuor apicalibus armata. Color metallicus, elytris macula lutea apicali notatis.*

* Obs.—The pale apical spot of the elytra is wanting in *M. virginica*, Fab., *M. femoralis*, Perty—and a few others.

† Mandibula sinistra dente 2do minuto. Labrum denticulatum. Type *M. Australasia*, Hope. (Port Essington, New Holl.)

Proc. Ent. Soc. Nov. 1841; Annals of Nat. Hist. ix. 425; White, in Append. to Stokes' Voy. Ins. pl. 1, fig. 1.

†† Mandibula sinistra dente 2ndo 3tio majori vel æquali. (*Tetracha*, Westw. Hope). Type *Cic. Carolina*, Linn. &c. (Amer. merid.)

J. O. W.

DESCRIPTION OF PLATE VII.

Figure 1. *Megacephala curta*.

2. Larva of *M. curta*?

3. *Megacephala Martii*.

4. Larva of *M. Martii*?

5. *Megacephala Spixii*.

6. Larva of *M.* — ?

7. *Megacephala quadricollis*.

8. *Megacephala asperula*.

2 a. Head of larva of *M. curta*? profile.

6 a. Dorsal segment showing the hooks.

6 b. Profile of do.